

ABSTRACT OF THE DISCLOSURE

A differential encoder generates a differentially encoded signal based on a data signal. An RZ (return to zero) encoder generates an electric RZ differential signal as an RZ signal in an electric area based on the differentially encoded signal. A Mach-Zehnder interferometer type intensity modulator generates an optical RZ- DPSK (differential phase shift keying) signal as an RZ signal in an optical area based on the electric RZ differential signal.